



# Puesto para Plantas in Nicaragua

‘A clinic where you can bring your sick plants’





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The Global Plant Clinic is an alliance of CABI, Rothamsted Research and the Central Science Laboratory, based in the UK. We provide diagnostic services for all crops in developing countries and work closely with extension services and others to improve plant health care for farmers. Our services range from research to technology transfer. We welcome collaborations to establish mobile plant clinics and improve technical capacity in disease diagnosis, detection and regulation.

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# Puesto para Plantas in Nicaragua

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**PASA - DANIDA**



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# Introduction to the English edition

The Global Plant Clinic is keen that other countries read about Nicaragua and their *Puestos para Plantas*. Many countries are interested in starting their own clinics and creating a public health care system for plants. Regular plant clinics now operate with GPC support in Bolivia, Bangladesh, Uganda and the Democratic Republic of the Congo (DRC).

This book first appeared in Spanish. We have reduced some of the text here but remain faithful to the original. First, a brief word about translating *Puestos para Plantas*. It literally means a stall or 'post' for plants in Spanish. We refer to 'mobile plant clinics' in English to emphasise that they take place in public places which growers visit. We also say 'plant clinic' or 'plant health clinics'. (In Bolivia they are *Postas para Plantas* and *Clinique Mobile des Plantes* in DRC.) The essential feature is that clinics provide plant health care –how to control pests and diseases– and not just a diagnosis.

Much has happened in Nicaragua since the Spanish edition was published. There are 6 new clinics, which we briefly mention in chapter 3; farmer demand for assistance continues to increase; the network of diagnostic laboratories is helping more plant doctors; more training courses have been held; a book of 31 fact sheets for farmers (*hojas volantes*) has been produced by the plant doctors.

Nicaragua is inspiring many other people to have a go with mobile plant clinics. They are a global leader, showing others how to provide public health care for plants. Funding from PASA II DANIDA and others has allowed us to establish the *Puestos para Plantas* but it is the commitment of the plant doctors and their organisations that makes me optimistic for the future. I believe that the networks created will become a permanent feature and continue once donor funds have run out.

This is a vital step forward. Human and plant health are linked in many ways. People and their plants suffer from many similar pathogens (e.g. bacteria), but while even small towns in the tropics have places to take sick people, even sick chickens, there is often nowhere to go for advice on sick plants. Poor, rural households grow much of their own food and also rely on crops for income. If their maize dies, they lose their food supply, and if their tomato crop is ruined, they may have nothing else to sell. This booklet describes an experience in Nicaragua to fill that gap.

The Spanish edition was dedicated to Hugo Fiallos and we note again his important contribution to getting the *Puestos para Plantas* started. We are greatly saddened that he is no longer with us. A stronger and more effective network of clinics, serving the farmers that Hugo helped and others, is the best testament we can provide to his memory.

Head of Global Plant Clinic  
October 2006





First graduating class of 'Plant's Doctors'. Estelí, september, 2005.



## Preface for the Spanish edition

*S*ince 2001 FUNICA has promoted new approaches to extension through the Funds for Technical Assistance<sup>1</sup> (FAT) striving for creative, timely, flexible advice, cost-efficiency and impact. One of these approaches is the *Puestos para Plantas* (mobile plant clinics) which were developed in 2005 as a kind of ‘basic service’ of FAT in Las Segovias.

The idea of ‘community services for plant health’ started in Bolivia with CIAT and PROINPA along with the Global Plant Clinic (GPC) to give information directly to farmers. The GPC has helped FUNICA and local organizations set up four mobile plant clinics in the Segovias, the first ones in Central America.

At the plant clinics, farmers can bring samples of sick plants and talk with technical staff about their crop diseases in the same way they would consult with a doctor or a veterinarian.

FUNICA encourages plant clinics in collaboration with local organizations, public institutions and the Global Plant Clinic. This book presents experiences from the first year and some tools on how to manage a mobile plant clinic. With the skills and networks now in place, there is a good foundation for the clinic model to be spread to other parts of Nicaragua.

*María Auxiliadora Briones*  
Head of FUNICA  
March, 2006

<sup>1</sup> FAT is managed by FUNICA in western Nicaragua with funding from the Ministry of Agriculture (IFAD), and in the Segovias with funds from PASA II DANIDA.

## Abbreviations

APRODER	Asociación de Productores del Norte
ASOPASN	Asociación Programa Agrícola San Nicolás
CCAJ	Cooperativa Central de Servicios Múltiples Campesinos Activos de Jalapa
CECOFOR	Central de Cooperativas Forestales
CETA	Centro de Enseñanza Técnica Agropecuaria
CIAT	Centro de Investigación Agrícola Tropical
CNEA	Comisión Nacional de Enseñanza Agropecuaria
CN-MIP	Comisión Nacional de Manejo Integrado de Plagas
CURC	Centro Universitario Regional de Camoapa
CURN	Centro Universitario Regional del Norte – Estelí
DANIDA	Danish International Development Assistance
DGPSA	Dirección General de Protección y Sanidad Agropecuaria
DFID	Department For International Development (UK)
EIAG	Escuela Internacional de Agricultura y Ganadería de Rivas
FAT	Fondo de Asistencia Técnica (FAT Segovias and FAT Occidente)
FUNICA	Fundación para el Desarrollo Tecnológico Agropecuario y Forestal de Nicaragua
GPC	Global Plant Clinic
INATEC	Instituto Nacional Tecnológico
INSFOP	Instituto de Formación Permanente
INTA	Instituto Nicaragüense de Tecnología Agropecuaria
IPM	Integrated Pest Management
ISNAYA	Centro Nacional de la Medicina Popular Tradicional
MAGFOR	Ministerio de Agricultura y Forestal
OIRSA	Organismo Internacional Regional de Sanidad Agropecuaria
PASA II	Agricultural Sector Program Support, phase II
PPP	Puesto para Plantas
PROMIPAC	Programa de Manejo Integrado de Plagas en América Central
PROINPA	Promoción e Investigación de Productos Andinos
UCATSE	Universidad Católica del Trópico Semi-Húmedo
UNA	Universidad Nacional Agraria
UNAN-LEÓN	Universidad Nacional Autónoma de Nicaragua – León
UNICAM	Universidad Campesina



### Summary

In 2005, FUNICA and the Global Plant Clinic started four mobile plant clinics (*Puestos para Plantas*) in the Segovias, in northern Nicaragua. The demand came from the users of FUNICA's Fund for Technical Assistance (FAT). The plant clinics give advice on plant health to many people, quickly and at a low cost. Local agricultural organizations<sup>2</sup> in San Nicolás, Estelí, Jalapa and El Jícaro were attracted to the idea and committed themselves to run the plant clinics.

A plant clinic typically opens one morning a week, in a public place where the general public can bring in samples of sick plants for a diagnosis and a recommendation. If the clinic staff cannot identify the problem on the spot, they send the sample to a lab for analysis. The farmer (or other user) receives a written recommendation with practical control options (a 'prescription').

The challenges of running a plant clinic include making a diagnosis based on symptoms, keeping records, and finding additional information to make appropriate recommendations. Offering a quality service requires training and support from expert institutions.

After the plant clinics started, several universities and crop protection institutions formed a Diagnostic Network to support the clinics. The Network brings together most of the plant health diagnostic expertise in Nicaragua. The Network's enthusiastic backing helped the staff of the plant clinics gain confidence as 'plant doctors'.

During their first year, the plant clinics received over 500 queries from some 375 clients in 46 communities for 60 crops. The queries revealed a wide demand for plant health advice. The plant clinic in Estelí sees the greatest diversity of crops and problems. In El Jícaro the plant clinic helped identify citrus leprosis, a quarantine disease, and immediately reported it to the Ministry of Agriculture, which began pruning diseased trees. In Jalapa, farmers brought in many cases of nematodes in coffee. So, the Diagnostic Network organized a workshop with plant clinic staff, farmers, and experts on nematodes. In San Nicolás they saved whole fields of potatoes by timely diagnosis of late blight.

The plant clinics are a public service which benefits the public immediately and directly. The three keys to success are:

- 1) the commitment of local organizations.
- 2) use of existing structures and resources.
- 3) the support of specialists.

The plant clinics offer public crop protection institutions another channel to reach the public.

<sup>2</sup> ASOPASN (San Nicolás), INSFOP-UNICAM, ISNAYA (Estelí), CCAJ, CECOFOR, APRODER, CETA (Jalapa), Santiago Cooperative, INTA (El Jícaro).



# 1. Setting the scene

## Plant protection in Nicaragua

Nicaragua has invested heavily in plant protection since 1990: integrated pest management projects, quarantine and plant health monitoring programs, and research and extension<sup>3</sup>. Nicaragua has experience, expertise and the will to create an impact.

Nicaragua also has a creative, non-hierarchical extension system: a network of NGO's, government, projects and semi-private firms. It seems that every possible extension method has been tried in Nicaragua: farmer-to-farmer, field schools, the



Sweet chilli (bell pepper) is attacked by several pests and diseases which reduce its quality and productivity.

zigzag model, ATP (Public Technical Assistance), the popular press, and others (FUNICA 2003; Staver & Guharay, 2003; Nathaniels, 2004; Martín, 2005; Sain, 2005).

Even so, most Nicaraguan farmers still lack access to good advice on how to keep their crops healthy (CENAGRO, 2001; CNEA, 2004). In many cases, agrochemical dealers are their only source of information. The consequences of inadequate pest and disease diagnoses are: crop losses, inferior quality of the products and pesticide abuse. All this constitutes an obstacle to food security and safety and to the competitiveness of Nicaraguan agricultural products (Dijkema, 2000; Lastres & Argüello, 2004).

In Nicaragua many projects have taught farmers about pests and diseases. But projects are exclusive: geared to certain crops, disease and groups of people. And when the project ends, so does the follow up.

## Fund for Technical Assistance – the demand commands

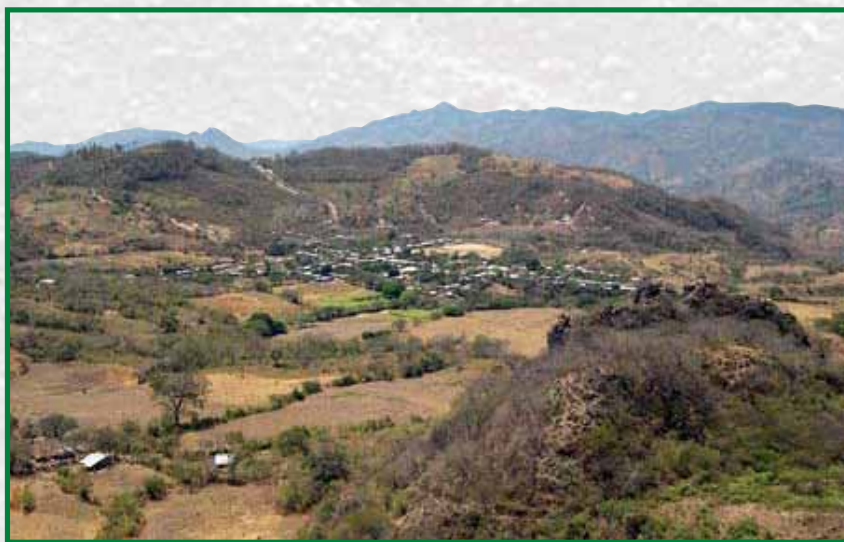
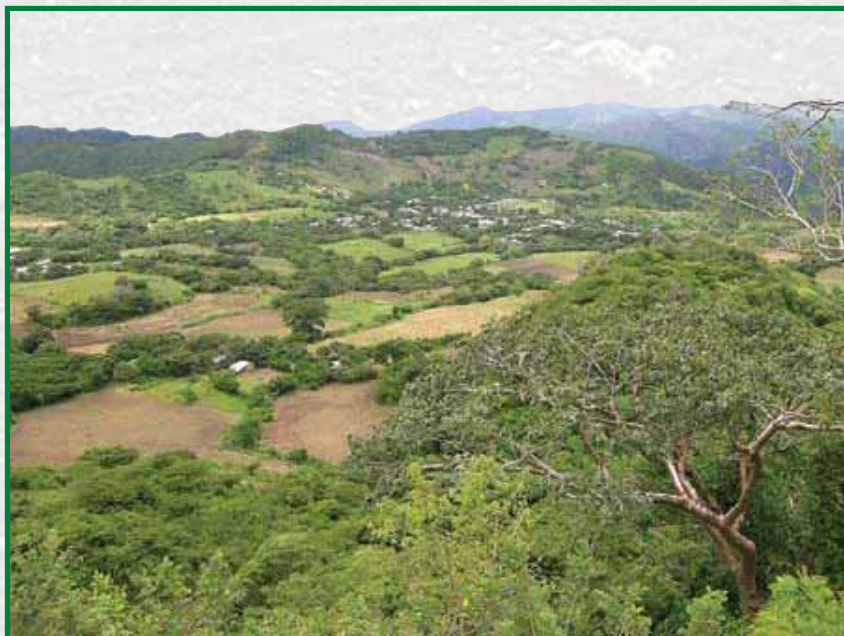
'The demand commands' (la demanda manda) has been a slogan of FAT in western Nicaragua (León, Chinandega) since 2001. FAT's farmer-clients were the first ones to call for a community service for plant health problems. In a survey, over half of FAT's clients said: "I only need a place where I can get help and advice when my plants are sick". This triggered the start of plant clinics as a community service.

<sup>3</sup> CATIE-NORAD, PROMIPAC, INTA, OIRSA and others.



## A community service for healthy plants

With local organizations and the Global Plant Clinic, FUNICA promoted four plant clinics in 2005 as a 'Basic Service' (i.e. not a project) of FAT/Segovias<sup>4</sup>. Inspired by the clinics, several specialist institutions (CNEA<sup>5</sup>, PROMIPAC, DGPSA, FUNICA) joined together as the 'Diagnostic Network' (Red de Diagnosticadores) in September 2005 to support the clinics with expert diagnosis and advice on pests and diseases.



**SAN NICOLÁS in March (up) and in September (below). As seasons and crops change, so do their pests and diseases, which is one reason why people need plant clinics year round.**

<sup>4</sup> The Fund for Technical Assistance for the Segovias covers 13 municipalities in the departments of Estelí, Nueva Segovia and Madriz.

<sup>5</sup> UNA, UCATSE, EIAG, CURN, UNAN-León, CURC, CETA-INATEC.



## Mobile Plant Clinics – a new approach

All living things get sick. Humans and animals have clinics, but plant health is often thrown to the mercy of chemical dealers. There are few plant clinics sponsored by universities, extension services and other institutions in northern countries, but few, if any, elsewhere. The rural communities in developing countries that need them the most are poorly served by clinics. However, there have been some new efforts to establish what we call ‘mobile plant clinics’ in Bolivia and Bangladesh (*Bentley & Boa, 2004*).

Mobile plant clinics start with a local institution, which has roots in the community, and which has agronomists on staff. These agronomists know the local people and local farming well, but they are agricultural generalists, not plant protection specialists. However, with a little encouragement and training, and with links to plant pathologists and other specialists, the community agronomists can rapidly solve the problems people bring in. The first step is as simple as putting up a sign and sitting behind a table in the shade, inviting people to come talk about plants. The plant clinics are usually only open for a few hours a week to make efficient use of staff time, and they are linked in a network over several communities.

The model of the mobile plant clinic is expanding to other countries such as Cuba, Colombia, Uganda, Kenya, Benin, Ivory Coast and India (*Boa, 2005a & 2005b*).

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The Global Plant Clinic ([www.globalplantclinic.org](http://www.globalplantclinic.org)) (GPC) is an alliance of CABI, Rothamsted Research and Central Science Laboratory, based in the UK. The GPC offers state-of-the-art diagnoses and support for pest and disease management, with an emphasis on tropical crops. The service is free of charge for developing countries supported by DFID.



## Mobile plant clinics around the world GPC and partners

### REGULAR CLINICS

**Nicaragua (4)** – “Puesto para Plantas”: ASOPASN [San Nicolás]; INSOP-UNICAM, ISNAYA [Estelí]; CCAJ, CETA, CECOFOR, APRODER [Jalapa], Coop. Santiago, INTA [El Jicaró].

**Bolivia (3)** – “Posta para Plantas”: CIAT de Santa Cruz, PROINPA, Universidad Mayor de San Simón.

**Bangladesh (3)** – “Phosholer Klinik”: Rural Development Academy, Shushilan (ONG), AAS (NGO).

**Uganda (4)** – “Eddwaliro lye Bimera”: Ministry of Agriculture, Animal Industries and Fisheries (MAAIF); National Agric. Research Org. (NARO); SOCADIDO (NGO); SG2000 (NGO); HORTEXA (exporters’ association).

### ... AND COMING SOON

**Cuba (2)** – “Posta para Plantas”: Instituto de Investigaciones en Fruticultura Tropical, Centro Nacional de Sanidad Agropecuaria.

**Kenya (2)** – “Zahanati ya Mimea”: Kenya Agricultural Research Institute.

**Colombia (1)** – “Posta para Plantas”: Universidad Santa Rosa de Cabal.

**India (1)** – “Plant Clinic”: GB Pant University

**Nicaragua (7)**: New clinics in 2006 with INTA and FUNICA partner organizations in Las Segovias and the western region.

Upper. Bolivia – Posta para Plantas.

Lower. Bangladesh – Phosholer Klinik.



## 2. An encouraging start

FUNICA knows the organizations in the Segovias and it was easy to identify some that were keen to have a plant clinic. The first two were in San Nicolás and Estelí. Then, some of the cooperatives in Jalapa and El Jicaró asked FUNICA to help them start two more clinics.





### A simple reply to a complex demand

Mobile plant clinics are a public service that advises farmers on pests and diseases the way a rural health centre does with humans. The staff that runs the clinics receives farmers' samples of unhealthy plants, diagnose the problem and give a written recommendation, a 'prescription'. Clinic staff plays the role of 'plant doctors'. If the problem cannot be solved on the spot, the staff sends the sample to a lab for analysis. When the lab results come back, the staff discusses them with the client. Most problems are solved without sending samples to the lab. Plant clinics create links with existing services, instead of starting new ones.

Everyone is welcome at the plant clinic. It is a public service for everyone in the community.

The staff opens the clinic by putting a table in a shady, public place, and setting out some eye-catching photos, literature and plant samples as conversation starters. Some of the users have to stand when they visit the plant clinics, especially the ones in crowded markets. But in El Jícaro, plastic chairs invite people to sit a while and discuss their plant problems. A good chat provides as much information as the actual sample.

All of the plant clinics have managed to convince people to bring in samples of plant problems. No plant is an island, and one sample at the clinic may represent more acres with the same problem. The staff in El Jícaro uses a weekly radio program to share results and advice of the clinic with dozens of farming communities.

It takes time to get clients used to bringing in plant 'patients' to the clinic. But continuously stressing the importance of bringing samples helps encourage this healthy habit.

### Crops, clients and queries

The four plant clinics have each created their own personality and a good reputation. In less than a year hundreds of farmers have had the opportunity to consult a clinic about plant health problems. The clinics have received over 500 queries for 60 crops from about 375 clients in 46 communities (see TABLE 1A and 1B).



Agronomist Bayardo López of ASOPASN (seated, centre) hands out information to community members.



## A community service for healthy plants

Table 1A. Summary of users and queries, four plant clinics, March 2005 to February 2006

PLANT CLINIC	USERS*	COMMUNITIES	QUERIES*	SAMPLES SENT TO LAB	NO. OF CROPS
Estelí	90	8	131	7	45
San Nicolás	110	14	142*	15	25
El Jícaro	75	13	110*	7	12
Jalapa	100	11	131*	8	16
<b>TOTAL</b>	<b>375</b>	<b>46</b>	<b>514</b>	<b>37</b>	<b>60</b>

\* Estimated number. At first, queries were not systematically registered.

### Crops

People brought in problems with dozens of species of plants, including maize, beans, and other crops people eat at home, but also commercial crops, like coffee, tomato and potato. There were fruit trees from the home garden: mangos and local varieties of oranges, perennial chillies, the kinds of crops that rarely enter the market, but are part of a healthy diet. People also brought ornamental plants, medicinal herbs (like rue) besides that acacia tree (TABLE 1B). All these plants are worth something to people, who demand help with them, even though conventional research usually works with just a handful of crops.



Crops on sale in the 'little green market' in Estelí.



## A community service for healthy plants

Table 1B. Summary of queries by crop, four plant clinics, March 2005 to February 2006

CROP	NO. OF QUERIES*	CROP	NO. OF QUERIES*
Citrus	27	Banana	3
Coffee	27	Grape	3
Avocado	25	Guava	3
Beans	24	Onion	3
Potato	21	Papaya	3
Orange	20	Soy bean	3
Tomato	19	Cassava	2
Maize	12	Cauliflower	2
Lemon	11	Garlic	2
Sweet peppers	8	Hog plum <sup>3</sup>	2
Passion fruit	7	Lettuce	2
Cabbage	6	Peanut	2
Dragon fruit	6	Pepper mint	2
Mango	6	Rue	2
Rose	6	Zucchini	2
Chaya <sup>1</sup>	4	27 crops <sup>4</sup>	1
Chilli	4	Details missing	24
Annatto <sup>2</sup>	3		
<b>CROPS, TOTAL</b>			<b>323</b>

\* About 191 queries were not documented between March-September 2005.

1-*(Cnidoscolus chayamansa)*; 2-*(Bixa orellana)*; 3-*(Spondias purpurea)*.

4-Acacia, *Anthurium*, Apple, Ayote (squash), Broccoli, Cacao, Carrot, Coconut palm, Cucumber, Gentians, Granadilla (*Passiflora spp.*), Jamaica flower, Mandarin orange, Matasano, Melissa (lemon balm), Mint, Oregano, Palm, Pasture, Pear, Plantain, Radish, Solfa, Sorghum, Strawberry, Swiss chard, Thyme.

### Diseases

Even though there are many crops, and many problems, the plant clinic staff has gained confidence. Practicing every week has allowed them to diagnose many of the most common pests and diseases (see ANNEX 1), over 70% of which have been diagnosed based on specific symptoms, for example: rusts, whitefly, aphids, plutella, leaf miner, sooty fungus and the coffee berry borer.

General symptoms (such as rolled, fallen or yellowed leaves, wilt, and rot) are harder to identify, because there are various causes, and a lab analysis may be useful.



Citrus have several diseases which may be difficult to tell apart.

## A community service for healthy plants

Plant clinics can be ‘early warning posts’. The clinic in El Jícaro sent a sample of a strange, new disease to the DGPSA lab, which identified it as citrus leprosis, a disease subject to quarantine. The plant clinic immediately alerted the Ministry of Agriculture and local Ministry officials began going from farm to farm, pruning diseased trees, cutting down the most severe cases, helping to stop the spread of this disease.

### Recommendations

—*What do I do with this pest or disease?*’ is the most frequent question the clients ask. Often, the recommendations are a menu based on local knowledge and experience. The clients appreciate getting a written recommendation or ‘prescription’, an innovation that emerged from the plant clinics.

The plant clinics strive to make appropriate recommendations. But they still need more information on pests and on technologies. During the first year the clinic staff wrote 20 flyers with clear messages for farmers (see ANNEX 3). It is an easy and cheap extension method.

Many remedies recommended in the Estelí clinic are based on tobacco, which is known to be an effective pesticide. Tobacco solutions really do kill insects and

**DIAGNÓSTICO Y RECOMENDACIÓN**

COOPERATIVA SANTIAGO + PROCOGER + INTA + ALCALDIA / JICARO

Planta/TAT: Pimiento (Zanahario) CLÍNICA GLOBAL DE PLANTAS

Nombre: Residente Valdivia Jiron

Comunidad: Yameli

Fecha: 20/05/05

Cultivo: Tomate

Código: JC-07

Identificación del problema: Marchites Repentina  
No identificada la causa

Recomendación: Realizar análisis de laboratorio y actuar de acuerdo a ellos. No continuar con el cultivo de tomate en esta plantación.

Una clínica donde usted puede traer sus plantas enfermas

Clients receive a ‘prescription’ with a written diagnosis and recommendation.

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Flyers convey clear, practical messages.



## A community service for healthy plants

they were the first pesticides banned in the USA because of health risks to workers who sprayed them. INSFOP-UNICAM is aware of the risks of using tobacco—and stresses that their recipes, based on cigarette butts and just the veins, not the whole leaf of tobacco— provide lower, safer doses than working with whole leaves.

INSFOP-UNICAM correctly cautions people to avoid even touching botanical insecticides, a precaution which was lacking in some of the earlier, more naïve programs by other institutions.

Botanical insecticides made from low doses of tobacco may be safer than earlier versions. They may be placebos, if applied on, say leaf miners. But compared with conventional insecticides, botanicals save money, reducing the cash expenses of poor people, and they break down within a few days of being sprayed. A fruit sprayed with tobacco solution will not have dangerous residues for long, and the consumers can wash off the traces of nicotine.

### Synthetic vs. botanical pesticides

Poor farmers around the world have rapidly adopted pesticides (*Williamson 2003, Winarto 2004, among others*). This cannot all have been due to the cunning salesmanship of dealers. Farmers like pesticides because they are cheap, easy and fast. Unfortunately, many cultural controls need years to take effect (e.g. crop rotation) and may also be expensive (e.g. replacing trees with resistant rootstock). Even so, cultural controls may be effective, are more environmentally sound than any concoction people can spray. The dilemma is that people demand chemical control (“What can I spray to kill this bug?”) and will happily switch from conventional to homemade chemicals.

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### Expert support

Good communication with specialists in the Diagnostic Network built mutual trust and confidence. Several times the plant clinic staff have told clients *‘I am not sure what it is, we had better send a sample to the lab for an accurate analysis’*. Thanks to the plant clinics, DGPSA’s diagnostic lab in Estelí now receives more samples than it once did (see TABLE 1A).



Through their links with the plant clinics, the DGPSA and UCATSE labs reach more farm families.



## A community service for healthy plants

The Diagnostic Network provides technical backing and participates in monthly meetings where the plant clinic staff can exchange experience, print documents, discuss logistical problems and plan training. The meetings help the team to stay enthusiastic, and to cultivate a spirit of commitment and collaboration. The Network has organized monitoring visits, training on entomology and pathology with universities (UNAN-León and UNA).

The plant clinic in Jalapa received many queries about nematodes in coffee late in 2005. It was a worrisome problem because farmers around Jalapa depend on coffee. In February 2006 the plant clinic staff and the Diagnostic Network (Professor Isabel Herrera from UNA and agronomist Harold Argüello from PROMIPAC) offered a practical course to 20 farmers and extension staff on how to manage nematodes in coffee, stressing healthy nurseries, clean planting material and destroying diseased trees.

### Record keeping

Every plant clinic has a register for writing a summary of each query. At first, many things went unwritten. But the plant clinic staff has realized that good records document the importance of their own work.

Register data (a code, client's name, date, community, crop, diagnosis and recommendation) help manage information and over the long run they generate a data base. The data complement official plant disease surveillance and help identify staff needs for information and training. Records also help spot topics for future research.

### Publicity

Plant clinics require a little perseverance. Hugo Fiallos of El Jícaro said: *"We open the clinic religiously every Friday, even if only one or two clients come. And we are going to keep promoting it until everyone understands that it is an important service for our communities."*

The plant clinics use several ways of letting the public know about their service:

- Radio and TV programs.
- Flyers (see ANNEXES 3 and 4).



Radio Líder in El Jícaro is heard by many rural families in northern Nicaragua. The clinic staff uses it for promotion and to discuss plant health problems on the air.



- Newspaper and journal articles.
- Communication with community leaders and with municipalities.
- Fairs and similar events.

### The first graduating class of 'plant doctors'

The plant clinic staff quickly realized that they needed training on field diagnoses and on information use if they were going to offer a good service. Sixteen people took the first course 'How to become a plant doctor' (see TABLE 2).



The first graduating class of 'plant doctors', Estelí September 2005.

The course taught agro-ecological principles, practical skills for field diagnoses and introduced the 'snowman model,' for writing flyers, a three-part outline:

- 1) Diagnosis—how to recognize the problem.
- 2) Bio-ecology—background information that helps to understand control options that might otherwise be counter-intuitive, and
- 3) Control options: i.e. a menu of technologies.

<sup>6</sup> Estelí, September 2005, GLOBAL PLANTS CLINIC/FUNICA.



## A community service for healthy plants

Table 2. Content of the training course 'How to become a plant doctor'

TOPIC	OBSERVATIONS
Field diagnosis	Recognizing and interpreting symptoms; how to identify the cause of a problem based on visual and verbal evidence; what to expect, based on pest and disease lists.
Writing reports and collecting sample	Giving correct information, accurately and clearly, on plant health problems; what part of the plant to select; how to prepare material to send to the lab.
Users and queries	Keeping records of users, giving queries a code, storing data, keeping tabs on samples sent to labs, monitoring the use of the plant clinic; designing forms.
Control options	Summarizing the main plant health problems in several areas; identifying the best control methods; writing flyers with clear messages.
Writing flyers	Simple ways to combine photos and text in short documents; sources of information on control options; taking and selecting good photos.
Connecting with diagnostic labs	Where to send material; costs of analysis; keeping a flow of information and of reports; understanding what labs can do.
Organizing and running a plant clinic	Publicity; reaching more users; selecting sites for plant clinics; linking with local government; widening the plant clinic Network to the national and regional level.

Recognizing symptoms was a major topic in the course.





### Three keys to success for plant clinics

**COMMITMENT** of local organizations is the most important. They have the advantage that the potential users of the clinics already know and trust the técnicos. And for the plant doctors it has been encouraging to experience how their prestige has grown, both within and outside their communities.

**USE WHAT IS ALREADY THERE.** The plant clinics are based on existing structures and resources. They avoid building anything new, which would then be costly to sustain.

**EXPERT SUPPORT.** The Diagnostic Network helps the plant clinic staff identify problems they are unfamiliar with. Before starting the plant clinics, several of the local organizations were even unaware that the DGPSA lab existed, even though it is on the Pan American Highway, just five kilometres from Estelí. And they never dreamed that UCATSE, a university, could become an indispensable partner.

With the plant clinics, everyone wins. The farmers resolve their crop problems. The clinics enrich the work of local organizations. Institutions that quarantine and monitor plant health get complementary data on problems in the field, and the plant clinics can act as 'early alerts' to new and emerging pests and diseases. And plant clinics give research and extension agencies a direct channel to spread information about crop protection.



The national maize fair in Jalapa was a good opportunity to let many people know about the plant clinic.



### 3. The clinics in action



#### The Clinic in Estelí

**Place:**

A weekly 'green' market in the town square, Estelí.

**Time:**

Fridays 8 A.M. to noon.

**Organizations:**

INSFOP-UNICAM e ISNAYA

**Contacts:**

Yamileth Calderón  
and Gustavo Molina, Tel. 713 2140.

**Started:**

11 march, 2005.

**Main crops:**

Avocado, beans, bell pepper, citrus, maize, passion fruit, potato, dragon fruit, cabbage, tomato.

The plant clinic in Estelí is in a popular weekly market, where many people come to buy and sell everyday items: local food, fresh vegetables, ornamental plants and handicrafts. The clinic has received queries on 45 crops, from the most important food crops to acacia.

#### A visit on 16th September

Darwin de Jesús Blandón is a young man selling ornamental plants a few meters from the clinic. The day of the visit, he brought a citrus leaf to the table. Agronomist Yamileth Calderón told him it was leaf miner, and wrote him the following recommendation for cultural control, and a prescription for a home remedy::

*The citrus leaf miner is not an economically important problem.*

1. *You can eliminate the leaves affected by leaf miners and burn them.*
2. *Apply tobacco with chilli.*

*10 cigarette butts diluted in ½ litre of boiled water. Drop in a little soapy water and leave it stand until overnight. The next day add 5 crushed chillies. Strain and apply the mixture. One must be careful not to let the solution touch one's skin. Cover your nose so as not to breathe the mixture.*

Calderón wrote quickly, with the self-confidence of someone who knows what she is doing. She correctly pointed out that leaf miners are often not a pest worth worrying about. Darwin seemed pleased as he walked off with his recommendation.

Then she explained that she only recommends using the cotton part of used cigarette butts.



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There is enough nicotine in just a few used cigarette filters to kill insects. She understands that nicotine in water is dangerous to humans, and is cautious not to recommend too much of it. *"You can also use the veins of tobacco leaf, just the veins, without the leaf".*

Calderón has worked for 11 years on the INFOP-UNICAM farm, doing experiments with smallholders. Every year she attends the Farmer Experimenter Meeting in September, where rural people explain their experiments. And almost all of their experiments are with botanical insecticides and other home remedies for killing pests.

Mr. Eric Raudes came to the table and told Calderón that he had a problem with 'carbón.' At first we did not understand, because in Central America, besides the common meanings, 'carbón' also refers to certain plant diseases, and Calderón thought he was talking about a cereal fungus. But no, it was the tree named carbón. The acacias are used for fodder, and his trees were drying up when they were only two years old. This time she didn't know what to tell him. But it shows that people need help with many crops, including forage trees. Recent programs in Nicaragua show an impressive attention to all the major food crops, and many vegetables. Yet still, people need help with more plants. Don Eric came back later with several samples of carbón to send to the DGPSA lab, which identified the fungus *Phytophthora* and the nematode *Pratylenchus*.

Calderón explained that Eric Raudes is one of her keenest and most insistent clients. Once he had a problem with bell peppers and came back several times to discuss the problem with her and



Eric Raudes explains his problem with 'carbón', a tree which Gustavo Molina recognized as *Acacia pennatula*.



to get more information. When Calderón showed him the IPM guide for bell peppers, by INTA, don Eric immediately went to the INTA office to buy one.

Agronomist Yamiléth Calderón brings years of experience and community service to the recommendations she writes in the plant clinic.



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Calderón enjoys the clinic, because as she puts it, it is a chance to do research. She showed us some of her older records of queries she had received in previous weeks. These were from people who had brought in samples, and Calderón had looked up the results in books. One of her written recommendations to a soy farmer said that the pest was ‘gusano terciopelo’ (velvet worm), *Anticarsia gemmatilis*. “If I have a scientific name here, it’s because I looked it up.”

Calderón has made the most of the Diagnostic Network. Once she received several queries on onion thrips, but she did not have information on dealing with this insect pest. She sent e-mails to Martín Urbina of DGPSA, Freddy Soza of PROMIPAC and Eric Boa of the Global Plant Clinic, asking for advice. “They all wrote back” she said happily. Sometimes she visits plant pathologist Martín Urbina in the DGPSA lab to talk about problems that people bring to the plant clinic and to ask for information and advice.



### The Clinic in San Nicolás

**Place:**  
Parish pharmacy, San Nicolás.

**Time:**  
Wednesdays from 8 A.M. a 1 P.M. (but samples are received everyday at the pharmacy)

**Organization:**  
ASOPASN

**Contacts:**  
Bayardo López and Francisco Dávila,  
Tel. 713 7785 / 821 1240.  
Francis Ubeda, Tel. 716 2168.

**Started:**  
15 June, 2005.

**Cultivos principales:**  
Beans, citrus, potato, tomato.

Francis Úbeda is responsible for the parish natural medicine pharmacy where the plant clinic is held every week. She receives any samples people bring from Monday to Friday. Agronomists Francisco Dávila and Bayardo López come every Wednesday morning to host the plant clinic in the shade of the neem trees on the main street of this small town, where half the traffic is on horseback. At first sight, the San Nicolás plant clinic seems hidden away, but it has a constant clientele.

### A visit on 21st September

Don Julián is a farmer who has been a promoter for several years. When he heard about the ‘plant doctors’ at the clinic, he went home and got a bag full of plants. Among other things, he had papayas with virus. Resistant varieties might help.

He also had avocado; the leaves were full of galls. When they were opened, small arthropods were seen, probably mites. One of the staff thought that the problem was not serious, but had a



## A community service for healthy plants

hard time convincing don Julián. It is easy to tell people to spray something; they will usually be willing to try anything, from cow urine to chemicals, but it is much harder to convince people that a symptom is causing little or no damage to their plant. Even so, the clinic must give clients the benefit of the doubt. The mite in avocado deserves more study, even if only to tell if it is a pest or not and to design a message that convinces people not to worry, that they should not spray anything. Such messages are needed to curtail the abuse of pesticides.

The staff in San Nicolás has sent several samples to the DGPSA lab. When they get the result back, one of the agronomists goes to the person's home, to discuss them. The community appreciates this service. According to Ing. Julio López of PROMIPAC, one of the samples was of potato late blight, and spreading the results around the community saved 30 hectares of potato, among dozens of families who had planted half a manzana.<sup>7</sup>



### The Clinic in El Jícaro

**Place:**

Santiago Cooperative building,  
El Jícaro.

**Time:**

Fridays 8 A.M. to noon.

**Organization:**

Santiago Cooperative, INTA.

**Contact:**

Dimas Sarantes, Tel. 735 2217 and 735  
2212.

**Started:**

17 June, 2005.

**Main crops:**

Avocado, beans, coffee, citrus, tomato.

El Jícaro is a town too small to have a bank and a supermarket, but it has a cooperative, with a store and banking services. Every Friday morning the staff sets up a plant clinic: table and chairs on the large, shady porch of the coop. The porch is pleasant, with many people walking through. Agronomist Dimas Sarantes of the Cooperative runs the plant clinic with the support of agronomist Alex Rodríguez of INTA. The plant clinic also has a program on local radio.

### A visit on 23rd September

The first visitor was the friendly and cheerful Jorge Pérez. He took five plant samples out of a plastic bag. Usually people bring one, or two. No one brings five samples unless they trust the plant clinic. He brought maize, bean, chilli, hog plum and lemon.

The maize was a seedling, planted in the second, dryer cropping season of the year. It had some yellow spots. Don Jorge did not know what it could be, because it was not a question of poor man-

<sup>7</sup> 0.7 hectárea



agement. *"The plant is wilting. It is not green, and I have fertilized the field. And the rain has been good".* The staff thought it might be soil pests. No, don Jorge assured them, because *"with white grub the whole plant dies"*. At any rate, few plants were affected, and the staff agreed with don Jorge that he should observe them and tell the clinic if more plants became ill.

*"I am interested in beans,"* he said, *"because I have planted five manzanas. Two are planted between (mature rows of) early season maize, and three are on bare ground."* But only the beans planted between the maize get sick. The ones in open fields are healthy. The sample he brought had no obvious symptoms. He had used good seed, INTA Red, purchased in the Cooperative. Don Jorge said that the crop started fine, *"but as it grew, some plants turn sad (sick)."* Fortunately, only a few plants were sick, some 50 plants in a manzana. The symptoms were ambiguous, but based on what don Jorge explained; the staff said it might be that the shade of the maize was harming the beans.



Jorge Pérez holds one of the four recommendations written by Ing. Sarantes.

Agronomist Dimas Sarantes agreed to take a sample of the beans to the DGPSA lab. Sarantes recommended removing any plants that died, and stirring lime into the hole. Don Jorge liked the idea. He knew that a disease could be in the earth, and that *"lime is very good."*

The chilli sample was a fruit from a perennial bush in his garden. It was a small, but spicy, tasty chilli. The information the farmer told about management was useful, because he said it was an old bush, which had begun "losing its resistance." At first, don Jorge thought the problem could be the ants, because he had seen them on the plant.<sup>8</sup> But, since the chilli was several years old, Sarantes recommended pruning it, like coffee, to renew it. Don Jorge liked that idea, too and said *"now I've got it"*.

The leaves of the hog plum had several holes, made by insects. *"Don't be alarmed,"* said Sarantes, *"the plant can take a lot more damage like that. You don't need to do anything."* Don Jorge seemed satisfied with the explanation.

And finally, he showed us a sample of lemon with scab. Sarantes pointed out that there are many problems in local citrus. They lose their leaves in the dry season, and grow them back when it rains. Improved varieties of oranges perform better.

After finishing his visit, don Jorge stayed comfortably seated with his four prescriptions, listening to the conversation with the next client.

Róger Alonso Céspedes came by to say that he had heard of the plant clinic on the radio. He had a serious problem. Twenty days earlier, he had transplanted half a manzana of tomato. Two weeks later the leaves started to curl. It was not like the diseases that don Róger had seen before. *"It is not a fungus, and it is not hielo."*<sup>9</sup> *The curl (crespo) is something else."* The leaves curled and the tips turned yellow. He had sprayed various insecticides and fungicides, several times, until there were

<sup>8</sup> He said they were big, fuzzy ants, but smaller than the 'bullet ant'. The only ant that size (and hairy) is the velvet ant, which is really a flightless wasp of the Mutillidae family. It preys mostly on other wasps, but does not damage crops.

<sup>9</sup> Literally, *hielo* means 'ice.' It is a folk disease with many causes. The main symptom is leaf yellowing (Bentley 1991).



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no insects, not even whitefly, and no doubt few fungi had survived. He had planted tomato three times in the same plot. We said that perhaps the disease was in the soil, and that he should rotate his crops.

But he had already done that. He had carefully planted early season beans after planting late season tomatoes. We explained that even so, the disease could be in the earth, because it could last for a long time. *“How long do I have to plant other things before planting tomato again?”* don Róger asked. It was a good question. It meant he accepted the hypothesis that the inoculum of the disease was in the soil, and that he was willing to experiment with crop rotation. We said it depended on the problem (nematodes, virus, bacteria, phytoplasmas, fungi, arthropods), which is why he needed a proper diagnosis.

A few days later, don Róger came back with a sample, and when the results came back from the lab, it was bacterial wilt. Sarantes explained to don Róger that he should stop spraying chemicals on his crop, since there was no cure. Don Róger accepted the results, and began to take crop rotation more seriously. Many other farmers were also losing their tomato crop, and Sarantes talked about bacterial wilt over Radio Líder, FM 95.7, in El Jícaro. The coop buys an hour of radio time every day, Monday through Friday, and Sarantes gets on the air at least once a week, which lets him speak to farmers in four municipalities.

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### The Clinic in Jalapa

**Place:**

The farmers' store, in the CCAJ Cooperative, Jalapa.

**Time:**

Every other Saturday from 8 A.M. to 1 P.M. Samples are received every day.

**Organization:**

CCAJ, CECOFOR, APRODER, CETA/INATEC.

**Contacts:**

Claudia Gurdíán [CECOFOR],  
Tel. 737 2500

José Rubén Sanabria [CCAJ],  
Tel. 737 2267.

**Started:**

19 may, 2005.

**Main crops:**

Avocado, coffee, beans, tomato.

Jalapa is a small city in a large valley devoted to maize, rice, tobacco and cattle. The plant clinic is run by four institutions in the building of the CCAJ cooperative: including a vocational agricultural school and two farmer cooperatives. The staff take turns running the plant clinic. They have had to make an effort to explain to the public that the clinic is not exclusively for members of the cooperative.

### A visit on 24th September

The day of the visit, instead of holding the plant clinic in the store at CCAJ, they had a stand to promote the clinic at the annual National Maize Fair in Jalapa. They had models of improved corals and boxes of showy insects to catch the eye of passers-by, while some of the university students explained the insects. The advantage of mobile plant clinics is that they are easy to move and set up practically anywhere where there are potential users.

Some people did stop by to ask for help with their plants. Andrés Guillén brought a sample of tomato, with yellow spots, probably virus. (There are several kinds of viruses, some transmitted by vectors, others by seed, and others by other ways). Ramón Rivera, an organic coffee grower, came by to talk about a problem that was killing his coffee. It attacked little patches of three or four trees, which first turned yellow, so we thought it might be nematodes. This was later confirmed by a lab analysis. Jalapa is a three-hour drive from the DGPSA lab in Estelí, and at first we thought the distance might be a problem. But the staff in Jalapa soon learned that at least someone in Jalapa drives to Estelí almost every day, and that people are usually willing to drop a sample off for them. The plant clinic has given the staff a connection to the lab that they had not had before.





## Quilalí

**Place:**  
The Cooperative 20 de Abril building.

**Time:**  
Monday from 8 A.M. to noon.

**Organization:**  
Cooperative 20 de Abril.

**Contacts:**  
Luis Arturo Roque, Tel. 735 5128.

**Started:**  
April 2006.



## San Juan de Río Coco

**Place:**  
The UNAG building.

**Time:**  
Thursday from 8 A.M. to noon.

**Organization:**  
UNAG.

**Contacts:**  
Milton Guerrero, Tel. 649 7889.

**Started:**  
April 2006.



## Somotillo

**Place:**  
From the main entrance to the market, 50y to the South.

**Time:**  
Wednesday from 8 A.M. to 11 A.M..

**Organization:**  
INTA and MAGFOR.

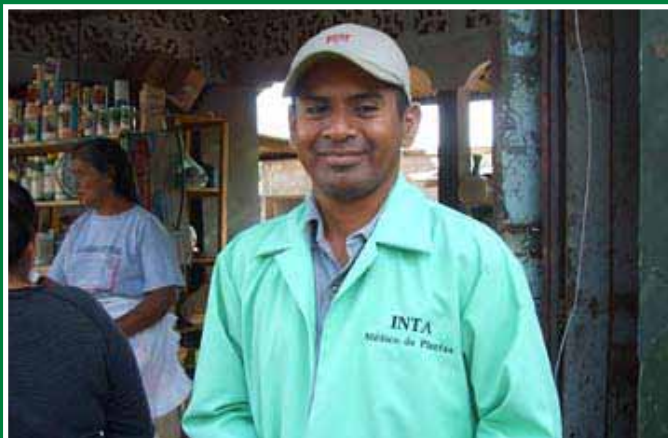
**Contacts:**  
Ronald Torres, Tel. 346 2202.

**Started:**  
June 2006.



## A community service for healthy plants

# THE NEW CLINICS



### Masaya

**Place:**

The market Ernesto Fernández, from the bus station, 2 blocks to the South.

**Time:**

Wednesday from 7 A.M. to 11 A.M.

**Organization:**

INTA.

**Contacts:**

Eduardo Espinoza, Tel. 850 8318.

**Started:**

June 2006.



### El Sauce

**Place:**

The bus terminal.

**Time:**

Thursday from 8 A.M. to noon.

**Organization:**

INTA and CETA.

**Contacts:**

Juan José López, Tel. 649 0507.

**Started:**

September 2006.



### Juigalpa

**Place:**

To be decided.

**Time:**

To be decided.

**Organization:**

INTA.

**Contacts:**

Francisco Pavón, Tel. 278-2280.

**Started:**

November 2006.



### 4. The future

Turning a plant clinic into a permanent service with a stable demand is a big challenge. The success of the clinics depends above all on the quality of the staff. The best lab and the most experienced plant pathologists are of little use without organized and motivated plant doctors to serve the clients locally.

The Diagnostic Network and INTA/CN-MIP play a crucial role in empowering the clinic staff, and should keep supporting them. The clinics need continuous training and follow-up to improve the quality of the service. Assessment of impact and clients' satisfaction is a pending challenge which needs to be addressed.

Even though there are now many publications on plant protection in Central America, more information and better control options for farmers must be identified. Much of the information is good, but some of it is also a little abstract. Farmers need more specific control options, and information on many more species of plants.

Running a plant clinic is inexpensive, using local structures and people. Local organizations provide staff time and pay the costs of travelling to coordination meetings and of sending samples to labs. Contributions from the Diagnostic Network cover the costs of basic materials (flyers, awning, magnifying glass, scissors, literature etc.), training and lab analysis (see ANNEX 5) and DGPSA provides technical support and written material.



The clinic staffs demand information to offer a good service. The technical guides from INTA are a big help.

The long-term sustainability of the clinics depends on the extent to which they deliver a service of quality that helps solve problems in the farmer's field and adds value to the existing crop protection institutions. So far the clinic and lab services have been free to the users, but sooner or later clients must be encouraged to pay for lab analyses, even if it is just a part of the real cost.

The plant clinics may eventually become 'local knowledge centres' to distribute information on: seed, post-harvest, soil and agronomic management and even animal health. PROMIPAC supports 'Agricultural First Aid Kits' (*Botiquines Agrícolas*) in several communities in the Segovias to improve farmers' access to agricultural supplies like seed, botanicals, biocontrol products and pesticides. Such initiatives help the plant clinics provide a complete service, from the identification of the problem to sound advice on accessible control options.

We must think of how to reach more farmers with better advice. Six more plant clinics were started in 2006. Many more are needed to create a national network of community-based, mobile plant clinics.



## 5. Guidelines for Plant Clinics

### Organization and dynamics

**THE CLINIC STAFF** is most often extension workers of local organizations and they know much about agriculture. They are not necessarily experts on pests and diseases, though they all know something about them.

**WHERE AND WHEN.** Most plant clinics are held one morning a week in a public place with lots of pedestrian traffic. It can be a market, a cooperative, or another place that attracts people. It is good to ask permission from the local authorities before starting the clinic, and to explain to them what it is about.

Do the following steps:

- Put a table in the shade, and some chairs too. Prominently display a plant clinic sign.
- Wear something colourful and distinctive, like a shirt or cap with the plant clinic logo.
- Use the table to arrange one copy each of various books<sup>10</sup> and flyers, where people can see them. Keep the other copies back, to control distribution better.
- Have a few samples of plants with common diseases to spark conversation. Some easy demonstrations (e.g. plants with and without treatment, good and bad seed, an insect collection) also help draw people in.



Upper. The clinic staff designed cloth signs. Each one has the same design; the only difference is the time and the institutions. Lower ... but drawing a sign on paper is also good, at least for a start.

<sup>10</sup> There are several good materials from INTA, CATIE y PROMIPAC/Zamorano.



## A community service for healthy plants

### BEHAVIOUR.

- There should always be someone to answer questions. Sit behind the table, not in front. As people approach the plant clinic give them a friendly greeting and explain how and when the clinic functions.
- Avoid talking among the staff if there are clients. It suggests that you are less interested in talking to the public. Do not drag the conversation on needlessly. If other people are waiting, they might think that you are busy and leave without talking about their plant problems.
- If a client asks you a question which you cannot answer, do not hesitate to say 'I don't know'. Then, try to find out the answer and come back with it the following week.
- Do not contradict people. After getting a good description of the problem and its surroundings you can suggest possible causes and control recommendations.
- If the plant clinic cannot be held, or if another event is replacing it, tell people in advance.



Don Julián Acuña opens his bag of samples while agronomist Francisco Dávila discusses the problem.



Agronomist Bayardo López of San Nicolás learns more about a problem. The samples on the table may help to describe or suggest symptoms.



### The art of a good diagnosis

In most cases, the plant clinic staff makes a diagnosis based on symptoms, and on the history of the crop and the problem. They try to identify the problem's most probable cause. This is called a 'field diagnosis', explained step-by-step in Annex 2.

Problems which cannot be identified with a field diagnosis must be analysed in a lab. Samples must be sent wrapped in paper and protected (for example, in a cardboard box or in an envelope). NEVER USE PLASTIC BAGS. Samples have to be kept cool and should arrive quickly to the lab. Each sample must be sent with the information given by the client on the crop and disease history



What is the evidence and the most probable cause of the disease? Ing. Julio López talks with doña Celina about her citrus problem. Her description helps to make a diagnosis.

### Appropriate recommendations

Once a problem has been diagnosed, the plant clinic gives an appropriate recommendation, which means:

- *Effective*; it really works.
- *Accessible*; available locally.
- *Timely*; available in time.
- *Safe*; for human health and the environment. Recommendations for pesticide use, even for botanicals, must be accompanied by advice on safe use.

Recommendations must be tailored to the client. Advice to 'remove infected plants manually' may be fine for a family with a quarter hectare of land, but not for one with three hectares.

Sometimes the best recommendation is: do nothing! It is a challenge to convince people that some symptoms are actually harmless, and not worth trying to control, such as leaf miners and scale insects. But keep trying, spraying pesticides may just cause worse problems later.

For some diseases like bacterial wilt or virus attacks there is little one can do to cure the disease. The best management is prevention: crop rotation, healthy planting material, and in the case of virus, screens to keep out whitefly.

A written recommendation or 'prescription' eliminates some risk of misunderstanding and forgetting and also helps the client share information with others. Flyers with photos and clear messages help spread information (ANNEX 3).





**The importance of knowing the difference.** *Canker* (left) is a serious disease which has destroyed thousands of hectares of citrus around the world. *Citrus scab* (right) rarely requires treatment.

### Records

Keep a record of queries by filling out a register, giving each query a unique code (see ANNEX 4). Write down the names of the people and where they are from. Listen closely and write what the person says, in their own words. Record the query even if the client does not bring a sample: suggest that they bring one the following week. Tell the client how to take a sample.

We recommend using a two letter code before the number of the query, so that each entry in the data bank has a unique code, for example: ES = Estelí, SN = San Nicolás, JC = El Júcaro, JP = Jalapa. Each problem in each crop must be registered as a separate query. For example:

José Rodríguez brings in two samples of citrus, one with leaf miner, and another with what looks like mildew. Give each one a separate code and number them consecutively, e.g. JC9 and JC10. When a person asks about whitefly in several crops, give a new code to each crop, to keep an exact record and because control recommendations may vary.

### Publicity

Each plant clinic has its own cloth sign, designed by the staff. Handing out a promotional flyer (ANNEX 4) is a simple, inexpensive way to make the clinic known. Try announcing the plant clinic on local radio or in the newspaper.

Every community has its own ways of spreading information. Use a little imagination. Join forces with the mass media of other programs, e.g. their radio programs or newsletters.

### Facing difficulties and risks

After an exciting start comes the hard work of holding a plant clinic every week. Inevitably, at some time the staff will face communication, logistic, personal or financial problems, especially in distant communities. There will be discouraging moments and one must be prepared for them. The main thing is good will, flexibility and creativity.

## A community service for healthy plants



Catchy slogans help to let people know about the plant clinics, e.g. 'If from pests and diseases you want to be free, the plant clinic is the place to be'.

Samples must arrive to the lab quickly so that they do not spoil, and it is not always possible to send them the same day. If there is a refrigerator, samples can be kept for a couple of days. Try to send samples with friends or colleagues who are travelling to the city. There are people going in all time, and in general they are willing to help out. In the same regard, lab results must be returned to the plant clinics rapidly since their reputation depends on giving results back quickly. Have clear arrangements with the lab about information flow. Sometimes a phone call is the quickest, easiest option.

Most organizations suffer from work overload and rapid staff turnover. A solid commitment from the institution is necessary for keeping the plant clinic open.



## Acknowledgements

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We thank the staff of CIAT (Santa Cruz) and PROINPA (Cochabamba) in Bolivia for setting the example of mobile, community plant clinics.







# ANNEXES



## Annex 1.- Summary of queries\* March 2005 – January 2006

CROP	DIAGNOSIS**	CAUSE NOT IDENTIFIED**
Acacia	<i>Phytophthora</i> , <i>Pratylenchus</i>	
Annatto ( <i>Bixa orellana</i> )	Mildew (3)	
Anthurium		Round leaf spots (fungus)
Apple		Spots
Avocado	<i>Phytophthora cinnamoni</i> (2), Fruit fly (2), defoliating caterpillar, Insect attack, Mealy bug, Aphids (2), Rust, Leaf miner, Sooty fungus	Information lacking (2), Leaf wilt (fungus), Yellowing, Not bearing fruit (2), Tree dries up, Leaf spots, Fungus
Ayote (squash)		Yellowing
Banana	Black Sigatoka (2), Yellow Sigatoka	
Beans	Golden mosaic (2), Angular spot (4), Flea beetle ( <i>Epitrix sp.</i> ) (2), Wire worm, Collar rot (9), Leaf beetle (5), Whitefly, Rot from excess rain, Weevil, Nitrogen deficiency	Information lacking, Wilting and discoloration (2)
Broccoli		Yellowing
Cabbage	Plutella (5)	Leaf spots
Cacao		Spot on the back of the leaf
Carrot		Information lacking
Cassava	Mites	Loss of leaves
Cauliflower	Whitefly	Leaf spots
Chaya ( <i>Cnidoscolus chayamansa</i> )	<i>Empoasca krameri</i>	Yellowing (3), Sterility
Chilli	Ants	Yellowing and leaf rolling, Leaves and mature fruit falling, Leaf drying
Citrus	Leaf Miner (9), Scab (2), Aphids (6), Scale insects (2), Lichen, Floury mealy bugs (4), Sooty fungus (2), Mites, Mealy bugs (3)	Information lacking (3), Falling fruit, Leaf spots
Coconut palm	Ant in the flower	
Coffee	Sooty fungus, Pellejillo (3), Rust (5), Anthracnose (2), Coffee berry borer, American leaf spot, Nutritional deficiency, Scalding, Nematodes (12)	Information lacking, Patches of trees wilting
Cucumber	Cabbage looper ( <i>Trichoplusia ni</i> )	
Dragon fruit	Bacteria ( <i>Erwinia carotovora</i> ) (4), Aphids, Weevil	Leaves rot, Flowers fall

## Annex 1.- Summary of queries March 2005 – January 2006 (cont.)

CROP	DIAGNOSIS**	CAUSE NOT IDENTIFIED**
Garlic	Thrips	Rot
Gentians	Aphids	
Granadilla ( <i>Passiflora spp.</i> )	Mite, Anthracnose	
Grape	Leaf-cutter ant	Sick root, Leaf spots
Guava	Sooty fungus	Malformation, Fungus
Hog plum ( <i>Spondias purpurea</i> )		Small windows in leaves, Premature maturity of fruit
Jamaica flower		The flower bud fails to open, then falls, the leaves turn yellow and the plant dies
Lemon	Scab, Army worm, Yellowing from lack of water, Floury mealy bug, Leaf miner (2), Gummosis	Fruit loss, Plant dries and does not bear fruit, Leaf rolling
Lettuce	Whitefly	Rot
Maize	Fall army worm (5), White grub, True bug, Rot from excess rain (2), Nitrogen deficiency	Yellowing, Dwarfing
Mandarin orange	Aphids	
Mango	Fruit fly	Malformation of fruit, Dieback of new growth (2), Lesions on front and back of leaves, 8 years of sterility
Matasano	Sooty fungus	
Melissa (lemon balm)	Scale insects	
Mint	Scale insects	
Onion	Blight, Soft rot, Thrips	
Orange	Floury mealy bugs (3), Tristeza, Aphids (2), Leaf miner (4), Mites, Leaf-cutter ants (3), Leprosis, Nutritional deficiency, Floury mealy bug	Death of growth tip, Leaf-rolling, Tree dries up after 3 years, Fungus
Oregano	Whitefly	
Palm	Sooty fungus	
Papaya	Fruit maggots, Rust and another fungus, Mites	Wrinkled, Falling leaves, Root rot
Pasture	Weeds	
Passion fruit	Passion fruit black caterpillar (2), Defoliating caterpillar (2), Insect eggs	Yellowing (2)



## Annex 1.- Summary of queries March 2005 – January 2006 (cont.)

CROP	DIAGNOSIS**	CAUSE NOT IDENTIFIED**
Peanut	White mould, Costa Rican army worm ( <i>Spodoptera sunia</i> )	
Pear	Sooty fungus, Scale insects	
Pepper mint	Scalding	Plant dries up
Plantain	Sigatoka	Leaf rot
Potato	Nematodes (10), Late blight (3), Early blight (3), Potato fly, Leaf beetle, Bacterial wilt, <i>Erwinia</i>	Plants die and tubers rot
Radish		Split root
Rose	Aphids (3), Caterpillar in the flower, Leaf-cutter ant, Nutrient deficiency	Leaf rolling
Rue	Scalding, Whitefly	
Solfa		Leaves fall
Sorghum	True bug	
Soy bean	Soy bean caterpillar ( <i>Anticarsia gemmatilis</i> ), Flea beetle ( <i>Epitrix sp</i> ) (2)	
Strawberry		Root nodules
Swiss chard	Whitefly	
Sweet peppers	Aphids, Leaf beetle, Whitefly, Nutritional deficiency, Weevil	Death of plants, Loss of flowers, Holes in the leaves
Thyme	Whitefly	
Tomato	Late blight (3), Bacterial wilt (5), Early blight, Golden mosaic, Virus/leaf-curling (4), Leaf miner, White mould, Poisoning from copper application (2)	Information lacking, Stalk rot
Zucchini	Mildew, Whitefly	
Details missing		Information lacking (24)
<b>Total</b>	<b>246</b>	<b>99</b>

\* About 191 queries were not documented between March – September 2005.

\*\* If a disease was found more than once the number is shown in brackets. A sample may have several diseases/types of symptoms.

### Annex 2.- How to do a field diagnosis – a guide

A 'field diagnosis' allows you to use symptoms and direct observation to identify the most probable cause of a plant health problem. It is the most common way of deciding why a plant is ill and which control method to use.

#### First step: Stop and think, ask, listen and observe

1. **GATHER EVIDENCE:** Find out all you can about the symptoms, including where they occur on a plant and how they develop over time, how many plants are affected and their distribution in the field, and other general information about crop management, site characteristics and history of the problem.
2. **POSSIBLE CAUSES:** Mentally prepare and consult a list of the major problems you know occur on this crop. For example, if it is lettuce there are two main reasons why they rot, both fungal diseases. If you do not know the crop well, look at reference lists or ask someone who is familiar with the plant. Show the client photographs of major diseases on the crop and ask them if these match the symptoms they have observed.
3. **ELIMINATE:** Reject insect pests and diseases which clearly do not match the available information or evidence. For example, coffee rust has distinct orange patches on the leaf. If these are absent, then it is another disease.

#### Second step: Make a decision

4. **CAUSE IDENTIFIED:** It may be possible to identify the cause immediately or be pretty certain. If there are orange patches on the coffee plant then it is coffee rust. But if you have someone describing production of small berries or blight in plants it will be more difficult to be sure of the cause. Your job is to find out more, by consulting other people.
5. **ASK FOR HELP:** Be honest when you can't match the evidence to a particular disease or organism and you can't be confident about the cause. Send samples to a local laboratory (DGPSA, UCATSE) or consult someone else (PROMIPAC) or send material to the Global Plant Clinic.

People are not trained to work with symptoms yet this is the most common method for deciding how to manage pests and diseases. Avoid saying that a rot is '*Fusarium*' unless you are confident about the cause. Similarly, if you say that a leaf spot is 'anthracnose,' are you sure it is caused by the fungus, *Colletotrichum*? It is possible to say that a disease appears more virus-like than bacterial-like but only use scientific names where they are justified.

Recognizing and interpreting symptoms in all plants is complicated but you can quickly learn some simple tricks to guide you through the different causes and how they affect different plants.



### How to do a field diagnosis – an example (cont. Annex 2)

Plant Clinic, El Jícaro. May 2005

Mr. Heriberto Valdiria from Yaulí came to the clinic with a sample of wilted tomato from his farm. He brought a whole plant with root and a soil sample. Don Heriberto said the whole plant wilts as the disease progresses. A long conversation unfolded between the plant clinic staff and don Heriberto. The wilt problem began three years ago and it has not helped to rotate crops, because the bell pepper, cabbage, potato and bean plants also wilt. Only maize stays healthy. The soil is good and the plants that survive are high yielding. Don Heriberto thinks that it is a soil problem because when he plants tomato in another field a thousand metres away, nothing happens. He has tried several chemicals. Recently he tried a mix of detergent and bleach, but so far no treatment has helped.



Ing. Alex Rodríguez of INTA talks with Mr. Valdiria about the problem in his tomatoes.

The wilt has several causes. It could be fungi, bacteria or nematodes. Some diseases are easy to recognize, for example coffee rust. But others are harder. Doing a diagnosis based on symptoms demands gathering all possible evidence about the behaviour of the disease and the history of the crop. After discarding possible causes one finally arrives at one or several possibilities. After discussing the tomato problem and consulting several books and manuals we arrived at the conclusion that the most probable cause was a wide spectrum fungus in the soil.

Because of the seriousness of the problem and the high risk of making a wrong diagnosis, we decided to take a sample to the DGPSA lab in Estelí. DGPSA found that it was not a fungus, but a bacterium (*Erwinia*<sup>11</sup>). Bacterial wilt is a serious problem with no cure once the plant is diseased. The recommendation given to Mr. Valdiria was: 'do nothing, at this stage the harvest is lost anyways'. He was also advised about crop rotation and seed quality, so that the problem would not be repeated again. The farmer lost his crop, but he saved money by avoiding pointless pesticide applications.

<sup>11</sup> This case deserves further study. Generally *Erwinia* species cause rot, not wilting. *Xanthomonas* and *Pseudomonas* cause wilt. However, the *Erwinia* identification was reconfirmed by the DGPSA central lab in Managua.

### Annex 3.- How to write flyers on plant health

- Tone and words** : You are writing for adults, who want to hear what you have to say. So just say it, straight and simple. Write in your own voice. Use short words that everybody knows.
- Illustrations** : Use illustrations to show new things. For example, if your audience knows the larval stage of an insect, show them the adult stage. Use photos to show the difference between two easily-confused diseases, for example. Photos should add information and not just decorate the text. When the farmers can easily recognize a problem, like coffee rust, a photo of the disease makes little sense. An illustration that shows one of the control options is better. Black and white drawings can be good, especially if people will photocopy your flyer. Colour photos may be useful, especially for showing disease symptoms. They are attractive, but are expensive to print and look terrible when photocopied, especially if the original is blurry.
- Size** : Half a page to a page, two pages maximum (two sides of one sheet of paper). The ones we prepared at the course had around 250–350 words. The trick is knowing what to leave out while keeping the message simple and accurate.
- Outline** : Keep a tight organization, starting with how to recognize the problem. Say something about its bio-ecology, and end with control. Bio-ecological information should help explain the background for the control strategy. Avoid distracting, irrelevant details. For example, if you are writing about a fungal disease, tell your audience how to distinguish it from similar-looking diseases caused by bacteria, virus and nematodes. Then write how the disease is transmitted, since this will help the readers understand for example, that it is a waste of money to apply fungicides to bacterial or viral diseases.

Another example, from a seed-borne disease:

TOPIC	QUESTION TO BE ANSWERED	INTENDED OUTCOME AFTER READING FLYER
Diagnosis	What are the symptoms?	Recognise the disease
Bio-ecology	What about the cause?	Learn that it is transmitted in seed
Control	What are the recommendations?	Plant healthy seed

- Know your audience** : Know your audience and write to their concerns. If you know that people are reluctant to apply manure because they think it spreads white grubs, tell them that the white grubs in manure are not the same ones that eat roots. People may be comforted to know that the virus in a tomato will not harm people. To explain crop rotation you have to know which crops are grown in the area, and if people rotate them in any specific order.



# A community service for healthy plants

## Examples of flyers with simple messages

The plant clinics in the Segovias now have 20 flyers (HV).

FLYER	ENGLISH TRANSLATION OF TITLE	AUTHOR
HV 1	How to take samples	Eric Boa, Solveig Danielsen
HV 2	How to recognize diseases caused by virus	Eric Boa
HV 3	Plutella, or the cabbage worm	Jeffery Bentley
HV 4	Whitefly	Jeffery Bentley
HV 5	Wilt in tomato has several causes	Eric Boa
HV 6	Fire ants in vegetable seedbeds	Jeffery Bentley
HV 7	White grub	Jeffery Bentley
HV 8	Fall army worm	Solveig Danielsen, Hugo Fiallos
HV 9	Coffee berry borer	Solveig Danielsen, Anita Pérez
HV 10	Birds and their damage	Francisco Dávila
HV 11	Potato late blight	Xiomara Rivera
HV 12	Pine weevil	Bayardo López
HV 13	Fall army worm 2	Carmen María Méndez
HV 14	Coffee rust	Dimas Sarantes
HV 15	Nematodes in coffee	Félix Jarquín
HV 16	Sigatoka	Gustavo Molina
HV 17	Wilt in potato	José Rubén Sanabria
HV 18	Weevil in sweet pepper	Yáder Gerardo Olivas
HV 19	Plutella in cabbage 2	Yamileth Calderón
HV 20	Leaf-cutter ant	Hugo Fiallos



### Tizón tardío en papa

Hoja  
volante

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#### Cómo es el tizón

Primero, las manchas verdes oscuras se forman en la punta de la hoja, y la hoja se muere a partir de la punta. Parece como si se le hubiera echado agua caliente. En ataques severos la planta puede botar todas las hojas. El tallo tiene una banda verde que lo estrangula y se dobla. Cuando cavamos las papas, vemos que tienen partes aguadas y hundidas.

No confundamos el tizón tardío con el tizón temprano. El tizón temprano tiene manchas de color café a negro, rodeadas de un anillo amarillo en las hojas más viejas.

La marchitez bacteriana es otro chamusco que mata a la planta, que se parece al tizón tardío. Solo que la marchitez bacteriana no empieza como manchas, sino como marchito.

#### La vida del tizón

El tizón tardío es provocado por un hongo, que se ve en el lomo de la hoja, como una cenicilla blanca. El hongo se alimenta de plantas vivas, pero el hongo produce una semilla que se lleva en los rastrojos de la papa. El tizón avanza más cuando hace frío.

#### Manejo

- Entierre los rastrojos fuera de la parcela.
- Siembre semilla sana. Siembre toda la parcela a la misma vez.
- Siembre en suelo bien drenado.
- No siembre solo papa. Después de cosechar la papa, siembre otra cosa, como granos básicos.
- No riegue con mariposas porque el salpique del agua lleva la enfermedad al cultivo.
- Puede usar químicos. En la casa comercial pida un fungicida derivado de carbamatos (clorotalonil, metalaxil) o cúpricos.
- Traiga sus muestras de una planta entera con raíces a su puesto de plantas más cercano, para que conozcamos y busquemos solución. Para mayor información visítenos en la UCATSE.







### Roya en Café

Hoja  
volante

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#### Como Reconocer la Roya

La roya empieza con una lesión, o un puntito anaranjado en el envés de la hoja. Si volteamos la hoja se verá el polvillo anaranjado.

#### La Vida de la Roya

La roya es un hongo que infesta a la hoja del café. Esto ocurre solo en el envés de la hoja. El hongo de la roya es un ser vivo, que echa semillas, que llamamos esporas. Esas semillas o esporas necesitan agua para nacer en la hoja del café. Así que una hoja seca, permanece sana.

El hongo necesita calor. En temperaturas de 22 a 24 grados centígrados el hongo se multiplica y crece dentro de la hoja.

Cuando una hoja se cunde de roya, no puede respirar y se enferma, y el palo produce poco café. Hasta en años venideros, sigue produciendo poco café.

Las hojas jóvenes son más valientes para resistir a la enfermedad. Y las viejas son las más cobardes que se caen tempranamente.

#### Manejo

Como la roya necesita agua para vivir, el cafetal no debe estar muy húmedo. Es bueno podar las partes enfermas de la plantas para evitar que pase la roya de un palo enfermo a uno sano.

No dejamos que el cafetal se llene de monte, porque la roya puede sobrevivir en las malezas.

Hacemos poda de los árboles de sombra, para que entre más luz y aire. Así el cafetal no esté muy húmedo.

Una buena fertilización de los cafetos ayuda, porque la roya prospera más en palos débiles.

Planifique bien las tareas, como son chapeas, control de sombra, fertilización, y otras. Porque un cafetal bien asistido es más sano.




AUTOR: ING. Dimas Sarantes Ramírez (Cooperativa Santiago, Jicaro)



## Annex 4.- Examples of materials used in the plant clinics

### Registers

 <b>BITÁCORA</b>				lugar del puesto	puestero / puestera
fecha	código	cultivo (solo uno)			
nombre		descripción del problema por el cliente			
comunidad y municipio		diagnóstico	acción tomada		
fecha	código	cultivo (solo uno)			
nombre		descripción del problema por el cliente			
comunidad y municipio		diagnóstico	acción tomada		
fecha	código	cultivo (solo uno)			
nombre		descripción del problema por el cliente			
comunidad y municipio		diagnóstico	acción tomada		
fecha	código	cultivo (solo uno)			
nombre		descripción del problema por el cliente			
comunidad y municipio		diagnóstico	acción tomada		
fecha	código	cultivo (solo uno)			
nombre		descripción del problema por el cliente			
comunidad y municipio		diagnóstico	acción tomada		



## Prescription and Promotional sheet

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 <p><b>UNICAM + ISNAYA - Estelí</b></p>	<p><b>¿Qué es?</b> Identifica las plagas y enfermedades de sus cultivos y da una recomendación técnica para su manejo</p> <p><b>¿Para quiénes?</b> Para los pequeños y medianos agricultores y agricultoras, instituciones, y otros miembros de la comunidad</p> <p><b>¿Cómo funciona?</b> Traiga sus plantas enfermas enteras o el insecto que las ataca.</p> <p><b>¿Dónde funciona?</b> En Mercadito Verde en el parque de Estelí</p> <p><b>¿Cuándo?</b> Funciona todos los días viernes de 08:00 de la mañana a las 11:00.</p> <p><b>¿Quiénes somos?</b> UNICAM, ISNAYA, FUNICA/FAT, Clínica Global de Plantas, PROMIPAC /Zamorano</p>
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 <p><b>DIAGNÓSTICO Y RECOMENDACIÓN</b></p>	<p><b>UNICAM+ISNAYA/Estelí</b> GLOBAL PLANT CLINIC FUNICA/FAT PROMIPAC/Zamorano</p> <p><i>Nombre</i></p> <p><i>Comunidad</i></p> <p><i>Fecha</i></p> <p><i>Cultivo</i></p> <p><i>Código</i></p> <p><i>Identificación del problema</i></p> <p><b>Recomendación</b></p>
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### Annex 5.- Diagnostic laboratories in Nicaragua: What current services offer

The DGPSA lab in Managua is the main reference centre for Nicaragua, managed by Ing. Lorena Jarquín. DGPSA charges 60.00 córdobas<sup>12</sup> for running samples for members of the public. DGPSA also has labs in Estelí, León and Rivas. Ing. Martín Urbina is the charge of the lab in Estelí, and an enthusiastic supporter of the plant clinics. DGPSA can identify bacteria, fungi, nematodes and invertebrates. DGPSA is a member of the Diagnostic Network.

UCATSE is a small private university near Estelí with particular expertise in entomology. They have a lab and a service for identifying insects, nematodes and fungi for a cost of 60.00 córdobas. They receive samples Mondays, Tuesdays and Wednesdays from 1 P.M. to 4 P.M. They want to develop the capacity to do soil analysis. Ing. Lilliam Lezama coordinates activities with the plant clinics in the Segovias. UCATSE is a member of the Diagnostic Network.

UNA in Managua has facilities for identifying pathogens and will receive samples. They analyse fungi, bacteria and viruses for u\$10.00. A nematode analysis costs u\$5.00. UNA has the only lab in the country which can identify virus. UNA is a member of the Diagnostic Network.

UNAN LEÓN has a strong tradition in entomology and is starting to work with plant pathology. They do not have a policy for charging to analyse samples, but they offer their expertise and collaboration to many institutions and organizations. UNAN LEÓN produces and sells products for the biological control of insect pests. UNAN LEÓN is a member of the Diagnostic Network.

El Zamorano, Honduras, has one of the most complete facilities in the region. They can identify insects, virus, phytoplasmas and other organisms. PROMIPAC/Zamorano is building several reference points for distance diagnostics in Nicaragua. PROMIPAC has a vast experience with pests and diseases and is a strong collaborator with the plant clinics, helping with training in field diagnoses of insects, besides providing literature and other information. Ing. Julio López co-ordinates activities with the mobile plant clinics in Las Segovias, and supports their expansion to other parts of the country. PROMIPAC is a member of the Diagnostic Network.

The GPC offers a free service for the expert identification of pests for developing countries, with funding from the UK Department for International Development (DFID). For information on how to send in material, visit: [www.globalplantclinic.org](http://www.globalplantclinic.org). The GPC also does literature searches and provides photographs.

<sup>12</sup> About U\$3.50.



## Annex 6.- Contacts

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In 2005, FUNICA and the Global Plant Clinic established four pilot mobile plant clinics (Puestos para Plantas) in the Segovias, northern Nicaragua, to respond to farmer demand for advice on plant protection.

At a plant clinic, 'plant doctors' examine sick plants, make a diagnosis and give a management recommendation. This simple community service is based on local skills, designed to meet the specific needs of clients quickly and at low cost. It is a public service, open to everyone.

After their first year, the plant clinics have given information and specific advice for helping plants to hundreds of families who usually have little or no access to technical assistance. This experience suggests that mobile plant clinics are a viable way of giving plant health advice directly to smallholders.